PRELIMINARY REPORT ON THE GEOLOGY OF THE ARCADIA BAY PROPERTY, CORONATION GULF, N.W.T.: A GRANITOID-HOSTED GOLD DEPOSIT

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ABSTRACT

In Canada, gneissic tonalite/trondhjemite and granodiorite have essentially not been considered as hosts for gold deposits. However, major Archean gold deposits in or associated with plutonic rocks are well established in Ontario and Quebec: Hollinger-MacIntyre, Renabie and Lemaque. There are 44 gold showings in the Northwest Territories that occur in plutonic rocks, 20 of which occur in the Anialik River Granite Gneiss. As such, the Arcadia Bay property in the Anialik River Granite Gneiss provides an excellent opportunity to study a granitoid-hosted gold deposit in the Slave Structural Province.

The main emphasis of this study is to ascertain the fundamental controls of gold mineralization in the Anialik River Granite Gneiss, specifically to test whether the gold-aplite-quartz vein/shear zone mineralization is magmatically derived. This work will also provide parameters for exploration within granitoid rocks in the Slave Structural Province.

INTRODUCTION

Geological mapping at 1:15,000 scale of a 9 km^2 area surrounding the Arcadia Bay gold property was carried out during July and August, 1987. This mapping forms the initial reconnaissance for a Ph.D study to elucidate the origin of gold mineralization in the aplite-quartz vein-filled shear zones in the Anialik River Granite Gnesiss.

This study will utilize field, petrographic, geochemical and geochronological data from the map area to:

1) provide a geochronological framework constraining the timing of deformation, metamorphic and mineralizing events affecting the rocks;
2) determine the nature of the contact between the Anialik River Granite Gneiss and the Anialik River Greenstone belt, and
3) to develop and test models for the evolution of the auriferous aplite-quartz vein-filled shears and determine their relationship to the regional geology.

The Arcadia Bay gold property is situated on the east side of Arcadia Bay, approximately 380 air miles north of Yellowknife, on the southern shore of the Coronation Gulf (Figure 1). Salt Lake is accessible from Yellowknife and Coppermine by float, ski or wheeled aircraft. Topographic relief rises

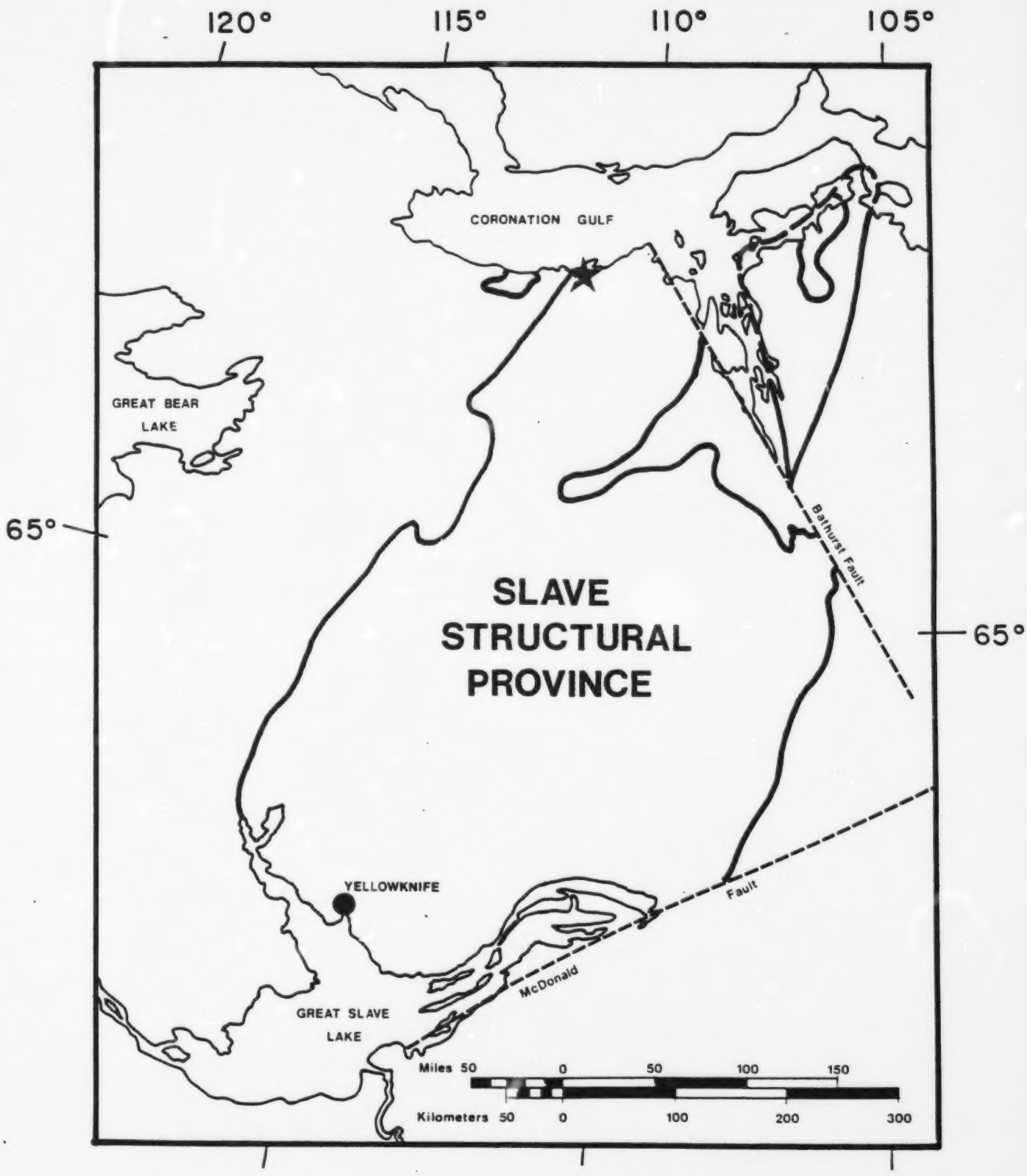

Figure 1 Location of the Arcadia Bay Property N.W.T.

★ Arcadia Bay Property

from sea level to 600 ft. above sea-level three miles from the coast. Outcrop exposure is extensive, approximately 60% overall, but much of it has a dense lichen covering. Most of the intervening areas are covered by low swampy land and pastures of tundra grass.

PREVIOUS WORK

The current map area forms a small part of previous larger-scale mapping projects by the Department of Indian Affairs and Northern Development and the Geological Survey of Canada. It was initially mapped by O'neill (1924) as part of the Canadian Arctic Expedition of 1913-1918. Fraser (1964) remapped the area during reconnaissance mapping of the northeastern district of Mackenzie. More recently, portions of the Anialik River Greenstone Belt and Granite Gneiss have been remapped at scales ranging from 1:28,160 to 1:125,000 by a variety of workers (Tirrul and Bell, 1980; Yeo *et al.*, 1983; and Jackson *et al.*, 1985). Padgham *et al.* (1983) undertook geochronological studies of the Anialik River Granite Gneiss.

REGIONAL SETTING

The Arcadia Bay map area lies at the northernmost tip of the Archean Slave Structural Province,and comprises rocks of the Anialik River Granite Gneiss and the northwestern arm of Anialik River Greenstone Belt (Tirrul and Bell, 1980). The Anialik River Granite Gneiss has yielded a 2.7 Ga U/Pb zircon age (Padgham *et al.*, 1983) and has been described by Jackson *et al.* (1985) as a weakly to strongly foliated, predominantly biotite +/- hornblende tonalite-granodiorite plutonic complex.

Padgham *et al.* (1983) suggested that the Anialik River Granite Gneiss formed as a synvolcanic anatectite, emplaced diapirically after crystallization into the Anialik River Greenstone Belt. Jackson *et al.* (1985)

stated that the contact between the intrusion and supracrustals is transitional along its southeastern and eastern margins, through a zone of leuco-granodiorite and abundant felsic and intermediate dykes. The latter intrude both the Anialik River Granite Gneiss and the volcanics. The western margin appears to be similar, but is also marked by an increase in intensity of foliation and the development of local zones of mylonitization which may be related to a prominent northeast trending tectonic zone, largely obscured by the Arcadia Creek valley. The granite gneiss is itself intruded by an early phase of mafic and intermediate dykes, which are deformed and discontinuous. Later felsic dykes, including granodioritic, granitic, aplitic and pegmatitic varieties, cross-cut earlier structures and dykes, and are themselves cross-cut by a final phase of aplitic and pegmatitic dykes.

A discordant post-tectonic quartz monzonite, the Chin Lake Stock, intrudes both the volcanics and the Anialik River Granite Gneiss along its southwestern margin. The last phase of cross-cutting intrusives are northwest and northeast trending gabbro, diorite and diabase dykes. The northwesterly trending dykes have been interpreted as belonging to the Mackenzie swarm (Tirrul and Bell, 1980; Yeo *et al.*, 1983; Jackson *et al.*, 1985), and have yielded a 1100-1200 Ga age (Leech, 1966). The northerly trending dykes may be related to the Coronation Sill diabase which caps many of the headlands and islands of the Coronation Gulf.

Padgham (1985) has defined two distinct types of volcanic belts in the Slave Structural Province.

1) Yellowknife-type volcanic belts characterized by a thick, predominantly basaltic succession with minor felsic volcanics, and
2) Hackett River-type volcanic belts characterized by a predominance of felsic volcanic rocks.

The northeast-southwest trending, v-shaped Anialik River Greenstone Belt, which encompasses the Anialik River Granite Gneiss (Figure 2) is a Hackett River-type belt. According to Tirrul and Bell (1980), Yeo *et al.* (1983) and Jackson *et al.* (1985), mafic meta-volcanic pillowed and amygdaloidal flows dominate the southern portion of the belt, whereas intermediate and felsic volcanic rocks and intercalated sediments are abundant in the two northern arms of the belt. Intermediate volcanics include phyric flows, fragmentals and tuffs, while felsic volcanics include porphyritic dacites, rhyolitic ash flows, fragmentals and quartz-feldspar porphyries. The felsic volcanics may constitute as much as 50% of the belt (Padgham, 1985). Interbedded volcaniclastic sediments include: arkosic arenites, pelites, carbonates, banded iron formation and conglomerates. The conglomerates contain granitoid gneiss and felsic volcanic clasts up to cobble size. Padgham (1985) suggested that the conglomerates are intravolcanic, having been derived from the uplifted Anialik River Granite Gneiss and local felsic volcanics.

Pre- or synkinematic quartz monzonite stocks intrude the volcanics in the Arcadia Bay area and elsewhere in the western arm of the belt. Numerous pink, leucocratic, fine-grained, quartz porphyritic and aplitic dykes intrude both the volcanic succession and quartz monzonite stocks.

Tirrul and Bell (1980) recognized that the Anialik River Greenstone Belt and Granite Gneiss have undergone four or more deformational events:

1) An intense flattening episode (D_1) which produced S_0/S_1 foliation and associated F_1 folds. Foliation trends wrap around earlier plutons.
2) A second event (D_2) refolds F_1 folds and produces an intense northeast trending axial planar schistosity (S_2).

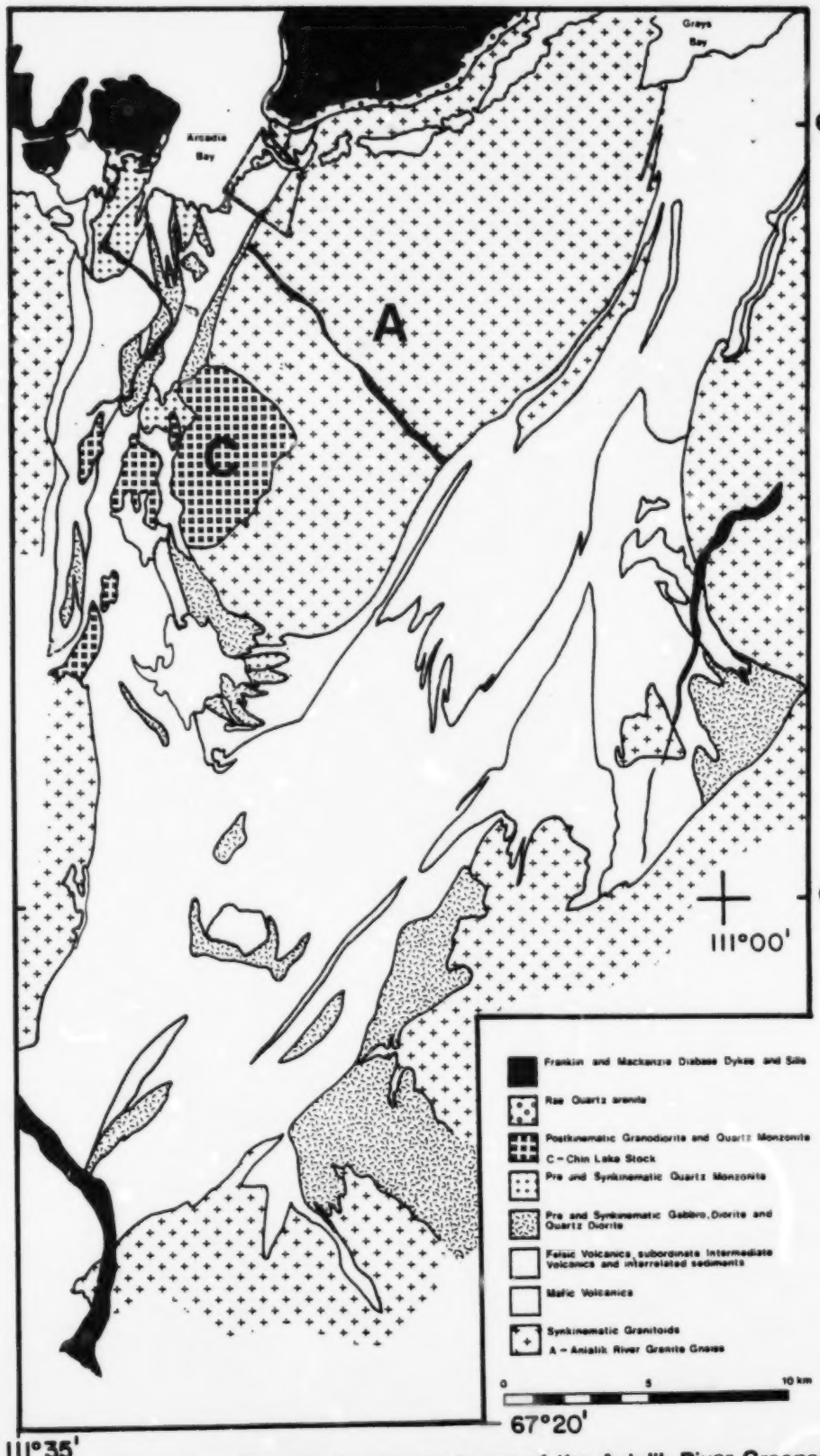

Figure 2 Simplified geological map of the Anialik River Greenstone Belt Modified from Tirrul and Bell (1980), ---- study area

3) A late (D_3) kinking or folding of earlier foliations about conjugate axial surfaces produced a crenulation cleavage, consistent with northeast-southwest compression.

4) A younger (D_4) set of conjugate northeast and northwest trending strike slip faults.

Rocks of the Anialik River Greenstone Belt have undergone low to medium grade, low pressure, low temperature metamorphism while those of the Anialik River Granite Gneiss have undergone high grade metamorphism. As all the rocks of the area have been metamorphosed, the term "meta" is generally deleted to avoid repetition.

ARCADIA BAY AREA ROCK DESCRIPTIONS

The Anialik River Granite Gneiss

All rocks along the western side of the Anialik River Granite Gneiss are moderately to strongly foliated with discrete zones of mylonitisation throughout.

The granodiorite is a coarse-grained, moderately to strongly foliated commonly prophyritic rock. Mineral composition averages; quartz 15-20%, mafics (hornblende and biotite) 10-15%, and staining indicates that plagioclase predominates over potassium feldspar. Hematisation and chloritisation produce a pink to greenish colour on an otherwise grey to white leucocratic rock.

The contact between the Anialik River Granite Gneiss and the supracrustals of the greenstone belt is transitional across a zone up to 500 m wide. The transition/hybrid zone consists of migmatite interlayered with granodiorite, tonalite and xenoliths. The layering, which varies from 1.0 cm to 30.0 cm thick, has been tightly to isoclinally folded about

north-northeasterly trending axial surfaces and plunging shallowly to the north.

Tonalitic layers are generally strongly foliated, medium-grained, moderately inequigranular, dark grey and weather to grey, beige or brown. Coarser-grained to pegmatitic granodiorite layers are pink, pale green-grey, beige and white. Much of the colouring is due to hematisation and chloritization which is most intense along shears and faults.

Narrow discontinuous quartz veins are common throughout the transitional zone and locally, leucogranodioritic anatectic "sweats" overgrow foliation. Agmatic migmatite is observed locally, with diorite and tonalite paleosome intruded by granodiorite neosome. Early dioritic dykes intrude the granodiorite.

Anialik River Greenstone Belt

The supracrustals in the map area comprise a predominantly felsic volcanic succession of quartz and quartz-feldspar porphyritic flows and intrusives, ash flow tuffs, lapilli tuffs, tuffs, agglomerates, breccias and subordinate related sediments. Minor mafic volcanic rocks, which include amygdaloidal flows, rare phyric and variolitic flows, and tuffs, are irregularly distributed throughout the supracrustal belt.

Mafic Volcanics:

Mafic amygdaloidal flows occur along the east shore of Arcadia Bay. These dark green-grey to black weathering rocks possess red hematite staining along fractures and shears; are typically very fine-grained; exhibit a hackly fracture; and locally a faint linear fabric. Their generally massive appearance is disrupted by anastomosing shears and minor fractures and faults.

The predominantly lensoid, quartz-filled amygdules, which may form up to 20% of the rock, range from less than 0.5 cm up to 10 cm in diameter. No

gradation in size, degree of elongation or alignment, or orderly distribution were observed.

Some mafic flows are variolitic: others are feldspar phyric, the latter containing 1.0 mm plagioclase euhedra which constitute approximately 5% of the rock. Trace amounts of pyrite and chalcopyrite occur within amygdules along shears as well as in the groundmass.

Subordinate chloritic and amphibolitic schists, not mappable at this scale, are intercalated with felsic and intermediate volcanogenic sediments, tuffs, fragmentals and flows. These mafic rock types are fine to very fine-grained and are dark grey or greyish-green on fresh and weathered surfaces. The chloritic schists are intensely foliated and a phyllitic sheen is common on foliation surfaces. Laminated fabrics are common whereas mylonitic fabrics occur locally. Plagioclase, quartz and accessory calcite and epidote occur in addition to chlorite. Amphibolitic schists occur along the eastern edge of the supracrustal belt where they are intercalated with finely-bedded felsic and intermediate volcaniclastics as well as possible volcanogenic sediments.

Intermediate Volcanics:

Intermediate volcanics comprise approximately 35% of the belt and include massive flow rocks, tuffs, lapilli tuffs and minor volcanogenic sediments. Massive flow rocks are fine-grained, pale grey-green, plagioclase phyric and contain up to 35% mafics, most commonly accicular amphibole and chlorite. The flows are cut by numerous quartz-carbonate-filled shears.

Lapilli tuffs are commonly matrix-supported with approximately 25-40% lens shaped, 0.1 to 5.0 cm long intermediate and felsic fragments within an intermediate matrix. A strong linear fabric is reflected by elongation of the fragments.

Fine- to very fine-grained chloritic, schistose, tuffaceous rocks of intermediate composition are interlayered with felsic and subordinate mafic volcaniclastics throughout the succession. They are typically grey-green to pale grey with quartz carbonate segregations, stringers and lenses. Volcanogenic sediments of intermediate composition occur only locally within the succession.

Felsic Volcanics:

Felsic volcanics form approximately 55-60% of the supracrustals in the area mapped and include flow rocks, pyroclastics, synvolcanic and porphyritic intrusives. Quartz and quartz-feldspar porphyritic flows, sills and dykes up to 3 m wide form at least 45-50% of the felsic sequence. These grey, pink, pale pink and beige weathering rocks are typically very fine-grained with quartz and feldspar phenocrysts composing approximately 10-15% of the rock. They characteristically contain less than 5% mafic minerals. Quartz phenocrysts have a distinctive blue to blue-grey colour. Although weathered surfaces commonly appear massive, these rocks exhibit intense schistose to mylonitic fabrics defined by both very fine layering, and stretched and flattened quartz and feldspar phenocrysts. Many of the dykes and sills are folded along with the volcanic rocks. One particular coarse-grained quartz-feldspar porphyry in the central part of the mapped supracrustals may represent a subvolcanic intrusive.

Fragmental volcanics comprise approximately 35-45% of the sequence and include pyroclastic breccia, agglomerate and lapilli tuffs, all of which are intermixed with flows and tuffs. Most fragmental rocks weather beige, grey or pink. In general, felsic fragments predominate over those of intermediate and mafic composition and predominantly lie within a very fine-grained pink to grey siliceous matrix.

Pyroclastic breccias are commonly poorly-sorted and are clast-supported with fragment:matrix ratios varying from 90:10 to as low as 50:50. Fragments range from less than 1.0 cm up to 40.0 cm in length, with larger angular fragments more prevalent.

Felsic agglomerates are fragment-supported with clasts ranging from less than 1.0 cm up to 20.0 cm in length. Felsic fragments constitute 80-85% of the clasts, the remainder having intermediate and mafic compositions.

Lapilli tuffs are primarily matrix-supported and commonly have a fragment:matrix ration of 60:40. Fragments range from less than 1.0 cm up to 5.0 cm, and are predominantly of felsic composition.

Finely laminated crystal phyric, crystal lithic and ash tuffs are locally interlayered with coarser fragmentals and flows. Crystal-bearing types contain millimeter sized feldspar crystals. A narrow mappable ash flow tuff unit is fine-grained, contains up to 10% mafic minerals (chlorite and biotite), scattered quartz phenocrysts and green-grey spherulite-like lenses. These randomly dispersed lenses, from less than 0.5 cm to 10.0 cm in length, comprise radial growths of quartz, epidote and chlorite.

Sediments:

Intervolcanic epiclastic and volcanogenic sediments do not form mappable units, but occur in the volcanic succession as minor, fine- to very fine-grained intercalations having felsic, intermediate and mafic compositions.

A distinctive 100-150 m wide zone of carbonatised and chloritised schists and mylonites extends and narrows from Salt Lake southwest towards the Arcadia Creek valley. Rocks in this zone are intensely foliated, very fine-grained chloritic schists and mylonites, \/areously weathering to a pale to dark

grey-green. Ubiquitous quartz stringers, lenses, segregation veins and interstitial carbonate occur throughout the zone as do gossaned pyritic areas.

Intrusive Rocks:

A variety of pre- syn- and post-tectonic intrusives are present in the area mapped.

The Salt Lake Stock:

The quartz monzonitic Salt Lake Stock occurs on the northeast shore of Arcadia Bay. It is a distinctive pink, beige or grey weathering, coarse-grained inequigranular rock. It is quartz-rich, averaging 30-35%, with a total feldspar content of approximately 60-65% and less than 5% mafic minerals represented by biotite, hornblende and chlorite. Feldspars are usually quite hematised producing a red to dark pink colouration. The quartz monzonite commonly exhibits a massive appearance, but is typically strongly to intensely lineated.

Numerous north and northeast trending chloritic shears that cut the stock produce up to 10 m wide zones displaying mylonitic fabrics. The sheared rocks commonly weather to a pale grey or greyish-green and have a "bleached" appearance compared with the pink hematised body.

The Salt lake Stock clearly intrudes the supracrustals as indicated by abrupt clean contacts and apophyses. Continuity of shear zones and deformed felsic dykes across both the stock and adjacent supracrustals, coupled with the intense linear fabric within the stock supports a pre- or syntectonic emplacement.

Felsic Porphyritic Dykes:

Pink to grey weathering, north to northeasterly trending, steeply dipping felsic porphyritic dykes intrude both the supracrustals and the Salt Lake Stock. Individual dykes, ranging from less than 0.5 m up to 3.0 m wide, are

not mappable at this scale. They have a very fine-grained groundmass, contain quartz and feldspar phenocrysts from less than 1.0 mm to 3.0 mm across and are virtually indistinguishable from the felsic porphyritic flows as both contain the ubiquitous blue and blue-grey quartz phenocrysts.

The dykes have been boudinaged and folded and also exhibit mylonitic and intense linear and planar fabrics.

Aplitic and Pegmatitic Dykes:

Aplitic and pegmatitic dykes intrude both the supracrustals and the Anialik River Granite Gneiss. In the supracrustals, the 0.3-2.0 m wide, pink or pale grey-beige aplitic dykes are typically north to northeasterly trending and have been variably deformed.

Four phases of aplitic and pegmatitic dykes occur within the Anialik River Granite Gneiss. The earliest phase is represented by north to northeast trending, greyish to pink weathering, leucogranodioritic and granitic aplite dykes. These dykes are typically parallel to the early foliation and are, themselves, strongly foliated, folded and locally mylonitised.

The second phase of dykes have a nearly consistent 030° trend, which is parallel to one of the major mineralized quartz vein-shear structures. These pink to grey weathering dykes cross-cut the earlier phase and also exhibit intense to mylonitic fabrics. Dykes within the mineralized main vein structures contain up to 3% disseminated pyrite and minor chalcopyrite, whereas dykes outside them contain less than 2% sulphides.

The third group of dykes trend 045° being subparallel to a second major shear direction. These aplitic and minor pegmatitic dykes are also pink, commonly intensely foliated, but have only local development of mylonitic fabrics. Disseminated pyrite and subordinate chalcopyrite are also present.

Fourth phase dykes cross-cut the earlier phases and generally trend about 345°. They are typically the least foliated and more pegmatitic of the four phases.

All four phases of dykes have variable dips, from vertical to subhorizontal, range from less than 5.0 cm up to 2.0 m wide, and locally constitute up to 15% of an outcrop.

Mafic Dykes:

Two west-northwest trending dioritic and gabbroic dykes intrude the supracrustals in the map area. An approximately 50 m wide mesocratic diorite dyke intrudes the volcanic sequence in the northern half of the supracrustal belt. The dark grey to brown weathering dyke is a massive, medium-grained, equigranular rock that occupies a linear recessive topographic feature.

An approximately 75 m wide dyke of medium- to very coarse-grained, inequigranular gabbroic diorite forms a large outcrop on the southeast shore of Arcadia Bay and extends 250-300 m inland. This distinctive black weathering, melanocratic dyke has an average composition of 75-80% hornblende, 20% plagioclase and 0-5% quartz.

Two ages of dioritic dykes intrude the Analiak River Granite Gneiss. The earlier phase consists of dark brown to black weathering, fine- to medium-grained, mesocratic rocks, that are typically disrupted, folded, boudinaged and appear as narrow elongate blocks in the granodiorite.

Relatively undeformed meso- to melanocratic diorite, which is exposed along Arcadia Creek valley, generally comprises hornblende and plagioclase. Deformation in this diorite is restricted to discrete carbonatised and chloritised shears that are parallel to the valley.

Diabase Dykes and Sills:

Two ages of diabase emplacement are recognized in the area. Northwesterly trending subvertical dykes, cross-cutting the supracrustals and Anialik River Granite Gneiss, belong to the Mackenzie swarm. These black to dun weathering, fine-grained dykes ranging from 15 cm up to 150 m wide, typically exhibit transverse cooling joints and chilled aphanitic basalt margins. A later set of more northerly trending diabase dykes cross-cut the earlier Mackenzie dykes. They may be related to the Coronation Sill which forms the coastal escarpment north of the present map area.

STRUCTURE

Rocks comprising the Anialik River Greenstone Belt and Granite Gneiss have undergone at least four phases of deformation. Primary volcanic and sedimentary features are variably preserved within the supracrustal belt. D_1 deformation is defined by an early schistosity (S_1) which appears to be parallel to primary lithologic layering (S_0), and is pervasive throughout most of the supracrustal succession. This S_0/S_1 foliation has a predominant north to northeast trend with moderate to steep dips to the west and northwest.

The earlier F_1 folds recognized, have north to northeasterly trending axial surfaces, that dip steeply to the northwest and southwest. These tight to isoclinal folds range from a few millimetres up to 7 m in wavelength, and plunge predominantly south and southwest. Linear fabrics (L_1), with moderate to steep, south and southwest plunges, are commonly associated with S_1 and F_1. Linear fabric elements include preferred orientation of long axes of deformed volcanic fragments, as well as mineral lineation, streaking and rodding.

A second generation schistosity (S_2), dipping steeply northwest and trending north to northeast, is approximately parallel to F_1 axial planar

surfaces. The S_2 planar fabric develops where a south to southwest plunging crenulation folds the S_1 foliation.

D_2 cataclastic deformation is evident in locally developed high strain zones which transpose early F_1 fold structures and further deform S_0/S_1 and L_1 fabrics. These zones are characterized by heterogeneous strain with S_2 fabrics varying from well developed schistosity and augen structures to protomylonitic flasering and mylonitic and protomylonitic hartschiefer banding. Although regionally extensive mylonite shear zones are not, as yet, clearly defined, a major structural discontinuity is inferred to coincide with, or lie close to, the Arcadia Creek valley.

A late, easterly striking fabric (S_3) occurs locally in the schistose supracrustal units. This fabric is axial planar to west to west-northwest plunging kink folds in the S_1 and S_2 foliations.

In the Anialik River Granite Gneiss the earliest D_1 deformational features, is represented by an early, weak to moderate S_1 foliation dipping steeply northwest to west, and striking north to northeasterly. Early F_1 isoclinal folds within the gneissic granodiorites and tonalites trend north to northeasterly and plunge shallowly north-northeast and northeast. Linear fabrics related to these S_1 and F_1 features have not been recognized.

The F_1 folds are transposed by a strong to intense foliation (S_2), which strikes predominantly north to northeast and dips steeply west to northwest. This foliation is represented by augened and flasered feldspar phenocrysts and locally important protomylonitic and ultramylonitic fabrics. Narrow northeast trending high strain zones of this age are associated with auriferous aplite-quartz vein bodies in the Arcadia Bay Property. The high stain zones range from less than 20.0 cm up to 10.0 m wide, and have strike lengths of up to 15 km. Those within the current map area form northern extensions of major

regional shear structures. Mylonitic "c" and "s" fabrics in these structures are characteristic of heterogeneous strain, and generally strike north-northeast and northeast respectively. Associated shear banding strikes north-northwest to north. Kinematic features in all the mapped shear zones indicate a sinistral sense of movement with a strongly developed linear fabric that plunges moderately to steeply, south to southwest. A later subvertical, northwest striking shear system cross-cuts the northeasterly shears, but appears to be less well developed. A synchronous development of the D_2 high strain zones in both the supracrustals and the granite gneisses is inferred from similarities in their strikes and plunge directions of associated linear fabrics.

Late brittle deformational features include easterly striking faults that cross both the supracrustal belt and granite gneisses. These faults are characterized by quartz-filled fault breccias comprising subeuhedral to euhedral bronze, pink and brown, and purple amethystic quartz, along with specular hematite enveloping breccia fragments of wall rock and fault gouge. A conjugate set of northeast and northwest striking faults, clearly visible in air photos, cross-cut the Anialik River Granite Gneiss, but are less apparent in the supracrustal belt. A northeast striking fault parallel to the Arcadia Creek valley appears to also cut the Proterozoic Coronation Sill. Indications of vertical and horizontal movement along these structures are not evident from this summer's mapping; however, Tirrul and Bell (1980) state that northwest trending faults exhibit features suggesting right lateral strike slip movement.

METAMORPHISM

Supracrustal rocks within the map area have undergone regional upper greenschist to lower amphibolite facies metamorphism. Retrograde metamorphism

has taken place along the shear zones where chlorite replaces hornblende and biotite. Migmatitic rocks within the shear zone of the Anialik River Granite Gneiss suggest that these rocks have undergone high grade metamorphism with later retrograde of hornblende and biotite to chlorite within shears and adjacent rocks. Further discussion awaits petrographic studies.

GEOCHRONOLOGY AND GEOCHEMISTRY

A systematic sampling program for petrographic, microstructural and lithogeochemical analyses was initiated this summer, with a total of 389 samples being collected. Six samples were collected for U-Pb zircon geochronological studies (Table 1).

TABLE 1: GEOCHRONOLOGICAL SAMPLES

87-7-12-37	Chin Lake Quartz Monzonite Stock
87-7-16-75	Salt Lake Quartz Monzonite Stock
87-7-20-103	Felsic Quartz Feldspar Subvolcanic Porphyry
87-8-18-343	Aplite Dyke associated with the North Vein
87-8-18-344	Anialik Granodiorite
87-8-23-379	Anialik Granodiorite adjacent to North Vein

MINERALIZATION

Mineralization in the Anialik River Granite Gneiss

The Anialik River Granite Gneiss hosts approximately 50% of the gold showings in plutonic rocks of the Northwest Territories, listed in the National Mineral Inventory (Padgham and Brophy, 1986). Gold was first discovered in the Coronation Gulf area in 1963, and since then has undergone several phases of investigation (geophysics and diamond drilling). Current reserves are estimated to be 480 kt grading 10.3 g/t gold.

Gold is associated with longitudinally extensive, predominantly north to northeasterly striking, aplite-quartz vein shear systems, subparallel to the northwestern margin of the Anialik intrusive complex. This summer's mapping concentrated on seven of the auriferous structures: 1. the Arcadia System; 2. the Number 9 Vein; 3. the Sphalerite Vein; 4. the Discovery Vein; 5. the central portion of the North Vein; 6. the northern extension of the "H" or Number 1 Vein; and 7. the Border Vein. Detailed 5.0 cm : 1.0 m mapping of trenches and extensive systematic sampling across the vein-shear structure exposed in the trenches was carried out.

The Arcadia System:

The Arcadia System lies just east of Arcadia Creek and comprises a series of narrow, subparallel to en-echelon structures within the Anialik granodiorite. Discontinuous sigmoidal quartz veins occur within mylonitised granodiorite and aplite.

The Arcadia structures strike predominantly northeast and dip steeply east; however, flexures and later shears appear to rotate the structures into northwest and east-northeast trends. Granodiorite and aplite undergo a rapid transition from moderate to strongly foliated through protomylonitic and into mylonitic rocks, generally in less than 2 m. Brecciation of the mylonitised host rocks is common and typically fragments lie within a matrix of quartz and silicified rock gouge. Alteration of the wall rocks includes chloritisation, saussuritisation and minor carbonatisation. Concentration of pyrite and subordinate chalcopyrite is variable in both the wall rocks and quartz veins.

The Number Nine Vein:

The Number Nine Vein lies approximately 550 m directly northeast of the Arcadia System. These veins occupy two parallel, northeast striking, steeply west dipping shear structures approximately 170 m long. Drag folded shear

structures plunge to the northeast within the central part of this zone. The southern exposures of this vein are typically enclosed by mylonitised granodiorite and aplite dykes and contain variable amounts of pyrite and chalcopyrite. The northeasterly extension is on first appearance radically different. Aplites are absent and the granodiorite is metamorphically segregated, exhibiting a transition from typical coarse-grained Anialik granodiorite into a narrow zone of interlayered leucocratic granodiorite with thin hornblende-rich segregations. The leucocratic granodiorite is also coarse-grained, but with less than 5% mafics (hornblende) help define the foliation. The hornblende-rich amphibolitic layers contain euhedral hornblende porphyroblasts up to 5 cm across. Up to 2% subeuhedral chalcopyrite and pyrite and 1-5% disseminated euhedral sphalerite crystals are also common. Folded layers of segregated sulphides and magnetite are also observed.

The Sphalerite Vein:

The Sphalerite Vein lies approximately 80.0 m to the east of the Number Nine Vein. This narrow aplite-quartz vein structure is no greater than 1.5 m wide and runs parallel to the Number Nine Vein for approximately 150 m. Quartz-hosted mineralization comprises relatively higher concentrations of sphalerite and galena, along with pyrite and chalcopyrite. Trace amounts of pyrite and chalcopyrite are also present in the wall rocks.

Discovery Vein:

The Discovery Vein lies approximately 90 m east of and parallel to the Sphalerite Vein and is a northeasterly striking, steep to vertically dipping structure. From the central part of this structure, the quartz vein narrows from approximately 2.0 m wide (which includes about a 1.0 m zone of quartz-filled breccia) to a 0.5 m width at the south end and to a series of

fine stringers across a 25 cm zone at its northern termination. The granodiorite and aplite are moderately to strongly foliated, but mylonitised wall rocks and breccia fragments are absent. Mineralization consists predominantly of pyrite with lesser amounts of randomly distributed chalcopyrite and galena. Pyrite occurs in 6 cm wide "nodular" aggregates of fine-grained euhedra and subeuhedra parallel to the quartz vein walls. The pyritic aggregates typically weather silvery grey, crumble when touched, and being recessive, leave grey to dark grey, masses of reticulated quartz and relict silver grey weathered pyrite.

'H' or Number One Vein:

The northern extension of this vein lies at the southeastern corner of the present map area. Although its name infers that it is a single feature, the 'H' or Number One Vein appears to be a series of discontinuous en echelon quartz-filled tension gashes. These quartz veins are steep to vertically dipping and strike predominantly north to north-northeast. The quartz veins, ranging from less than 30.0 cm up to 1.0 mwide, appear sparsely mineralized. The larger quartz vein is white, barren, "Bull quartz". Smaller veins and stringers contain minor amounts of chalcopyrite and pyrite with gossans of hematite, limonite and malachite. Mylonitised wall rocks are rare, but mineralized fragments of granodiorite, quartz monzonite and aplite within the associated quartz-filled breccias exhibit definite protomylonitic and mylonitic fabrics.

The North Vein (Central Portion):

The central portion of the North Vein lies approximately 760 m southeast of the Arcadia Creek valley. It is a linearly extensive, steeply west dipping, northeast striking structure, intermittently exposed for approximately 4.0 km south of the present map area. The structure pinches and

swells along its length, partly caused by anastomosing shears. Quartz veins lie within intensely foliated to mylonitised granodiorite, aplite or both, and range from less than 0.2 m up to 1.0 m thick. Narrow stringers, pods and lenses of quartz are common within the aplite and granodiorite, and locally the quartz veins appear to anastomose around zones of brecciated wall rock. Brecciated zones, from 0.1 m to 1.0 m wide, are intimately associated with the vein structure, and contain angular fragments, up to 25.0 cm in size, of intensely foliated and mylonitised wall rocks in a quartz matrix/infill. This clearly indicates that late brittle faulting took place along the North Vein after mylonitisation, which is typical of most of the aplite-quartz vein shear structures in the map area.

Pink, northeast striking and steeply dipping, aplitic to pegmatitic dykes generally less than 2.0 m wide occur within and adjacent to the North Vein along its length. These dykes are variably deformed, depending on their location relative to the main shear. Sinistral movement is inferred from the kinematic indicators in the mylonitised rocks, as well as the shape of flexures in the wider exposures of quartz veins. Smaller quartz-filled sigmoidal tension gashes are common along the North Vein.

North Vein mineralization predominantly comprises pyrite, with minor chalcopyrite, galena and trace bornite. Fine- to very fine-grained euhedra and subeuhedra pyrite occurs as narrow bands in grey to dark grey quartz, parallel to the vein wall. The central portions of the quartz veins are vuggy and reticulated, and the quartz is typically white with an iron oxide staining of fractures. Subordinate chalcopyrite occurs within pyrite aggregates and vugs. Malachitic coating is commonly associated with chalcopyrite. Galena occurs locally in the vein centre as small, 2.0-3.0 mm, clusters associated with chalcopyrite and pyrite. Very finely disseminated pyrite and trace

chalcopyrite are present in wall rocks and breccia fragments Alteration of wall rocks includes sericite and chlorite, and locally abundant carbonate occurs within some vuggy quartz veins as a beige to cream coloured infilling.

The Border Vein:

The Border Vein, which lies west of Arcadia Creek, is the westernmost vein in the Arcadia Bay property. A 0.5 m wide quartz vein, that has been traced for 20-25 m occurs in the mylonitised granodiorite and aplite. Mineralization includes pyrite and chalcopyrite which occur in bands and as disseminated aggregates in the quartz vein, and as finely disseminated grains and euhedra in the wall rocks. A 23.0 cm wide discontinuous quartz vein, parallel to and approximately 50.0 m to the west of the Border Vein, occurs in mylonitised felsic volcanics. Here, mineralization consists of a 5.0 cm wide band of coarse pyrite euhedra.

Mineralization in the Anialik River Greenstone Belt

Mineralization within the greenstone belt is restricted to heavily gossaned pyritic zones up to 1.0 m wide, predominantly occurring within the felsic tuffaceous and carbonatised schistose units. Mineralization consists of finely disseminated pyrite with subordinate chalcopyrite comprising less than 3% of the rock or as small aggregates of massive pyrite associated with quartz stringers and lenses.

A 0.5 m wide mineralized zone, in the Salt Lake Stock, consists of up to 1-2% finely disseminated pyrite in numerous, parallel, quartz-filled, northeast striking shears in an otherwise massive quartz monzonite. Pyrite also occurs as aggregates from less than 1.0 cm up to 30.0 cm asssociated with lenses and stringers of quartz within the shears.

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